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Request for grant of a patent

14JAN02 E687607-1 D02846
P01/7700 0.00-0200677.3

1. Your Reference: **AWN/CK/V903**

2. Application number: **0200677.3** 14 JAN 2002

3. Full name, address and postcode of the or each Applicant

 Country/state of incorporation (if applicable)

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Incorporated in: UK

4. Title of the invention: **LOCKING MECHANISM**

5. Name of agent: **APPLEYARD LEES**

 Address for service in the UK to which all correspondence should be sent:

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 Patents ADP number: **190001** ✓

6. Priority claimed to:

Country	Application number	Date of filing

7. Divisional status claimed from:

Number of parent application	Date of filing
-	-

8. Is a statement of inventorship and of right to grant a patent required in support of this application? **YES**

0026100 14 Jan 02 02:00

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9. Enter the number of sheets for any of the following items you are filing with this form. Do not count copies of the same document

Continuation sheets of this form	
Description	11
Claim(s)	
Abstract	
Drawing(s)	16

10. If you are also filing any of the following, state how many against each item

Priority documents	
Translation of priority documents	
Statement of inventorship and right to grant a patent (PF 7/77)	
Request for a preliminary examination and search (PF 9/77)	
Request for substantive examination (PF 10/77)	
Any other documents (please specify)	

11. We request the grant of a patent on the basis of this application.

Signature: APPLEYARD LEES

Date: 14 January 2002

12. Contact: Alastair W Neill- 01422 330110

LOCKING MECHANISM

The invention relates to locking mechanisms and particularly to locking mechanisms for use with structures, for example to lock at least one door and/or window of a building such as a domestic home.

The invention provides a locking mechanism for use with at least one door and/or window of a structure, the mechanism comprising at least one operating handle and at least one electrical operating device.

The electrical operating device may comprise at least one remote control device.

The remote control device may comprise a fob which may be manually operated, e.g. by a householder from outside a building, to unlock a door or window.

Preferably, the locking mechanism comprises a first rotatable member associated with the handle, a second rotatable member spaced from the first rotatable member and associated with a dead bolt, and a control member extending between the first and second rotatable members.

The second rotatable member may be movable into a locking position in which it causes the control member to prevent operation of the handle.

The second control member is preferably rotatable by means of a motor.

The motor is preferably associated with a gear train which provides a high mechanical advantage in favour of the motor, for example by incorporating a worm.

The locking mechanism preferably incorporates a first clutch to enable the second operating member to be manually rotated if desired, notwithstanding the connection of the second rotatable member to the motor.

The locking mechanism may incorporate a second clutch arranged to slip once the motor has moved the second rotatable member to a predetermined position, the change in electrical current to the motor, on slippage of the second clutch, providing a readily detectable and identifiable signal indicating that the motor has achieved its function.

The control member may comprise a control link which, when the second rotatable member is in the locking position, is locked against movement by a cam associated with the second rotatable member, the other end of the control member locking the handle against movement.

The control member may operate to lock the handle against movement by the engagement of a projection in a recess.

Preferably, there is an internal handle and an external handle, both of which are locked against movement when the second rotatable member is in the locking position.

The cam may have a day latch position in which it does not prevent movement of the control member, but the control member is biased into a locking position.

Preferably, when the control member is biased into the locking position, the external handle cannot be moved, but the projection and recess locking the internal handle are such that there is a ramp surface so that the internal handle can be moved, the associated projection riding along the ramp and out of the recess.

This enables a house door, for example, to be put into a condition in which the door can be immediately opened from inside the house without any key or fob, but the door cannot be opened from outside the house without use of the fob.

Preferably the locking mechanism is such that operation of the fob causes the control member to move into a position in which the projection is clear of the recess and both the internal and external handles can be operated.

The locking mechanism may be such that after a door has been opened using the fob, and then closed, the locking mechanism moves into the day latch condition.

There may be a short delay before the locking mechanism moves into the day latch position, for example from 5 to 10 seconds.

The locking mechanism may be associated with internal safety devices, for example at least one smoke detector, at least one burglar alarm and at least one panic button.

The locking mechanism may be linked to other locking mechanisms on other door and/or windows, so that several entry points on a structure may be controlled from a single locking mechanism, for example using the fob associated with that locking mechanism.

The second rotatable member may be manually rotatable by a knob, the knob being arranged so that it is difficult for a small child to operate.

For example it may be necessary to press the knob in and keep the knob pressed in before it is turned.

The locking mechanism may be such that pressing the knob in causes one drive gear associated with the second rotatable mechanism to engage with another such drive gear.

The invention includes a moveable panel such as a door or window, fitted with an embodiment of locking mechanism according to the invention.

The invention includes a structure fitted with a locking mechanism according to the invention.

By way of example, a specific embodiment of the invention will now be described, with reference to the accompanying figures, in which:

Figure 1 is a diagrammatic illustration of a door fitted with an embodiment of locking mechanism according to the invention;

Figure 2 is a front view of the entire assembly of the locking mechanism as it would appear from inside a building;

Figure 3 is a view similar to Figure 2 but with an inside back plate removed;

Figure 4 is a view of the assembly of Figure 2 from the rear;

Figure 5 is a view similar to Figure 4 but with a gearbox lid removed;

Figure 6 is a view similar to Figure 5 but with a printed circuit board also removed;

Figure 7 is a perspective view of the locking mechanism with a gearbox in a locked position;

Figure 8 is a view similar to Figure 7 but showing the gearbox in an open position;

Figure 9 is a view similar to Figure 8 but showing an internal handle of the mechanism in a down position;

Figure 10 is a perspective view with the gearbox shown in a day latch position, from the inside;

Figure 11 is a view showing the gearbox in the day latch position, from the outside;

Figure 12 is a perspective view of components of the locking mechanism, including a main clutch assembly, a motor clutch assembly, and a split hub assembly controlling inside and outside handles;

Figure 13 is a sub assembly view of the gearbox of the locking mechanism;

Figure 14 shows components of the motor clutch assembly in more detail;

Figure 15 shows components of the main clutch assembly in more detail; and

Figure 16 shows in more detail components of a child proof device of the gearbox.

This embodiment of locking mechanism will be described in connection with a front door of a domestic home but the locking mechanism may of course be used with other doors, windows, or indeed any hinged panel which is to be locked to a frame.

The door shown in Figure 1 comprises a panel 10 hinged to a frame 11. The door has an inner handle 12 attached to the locking mechanism 16 and there is also a similar external handle although this cannot be seen in the figures.

The door has a conventional spring catch 15, two conventional security hooks 17 and a dead bolt 18. The locking mechanism is associated with an operating fob 14 having a push button 13, shown in Figure 1 to a larger scale.

In a conventional, unlocked condition, the internal handle 12, an external handle can be used to open and close the door, the spring catch 15 keeping the door closed when the panel 10 is flush within the frame 11.

If it is desired to engage the security hook 17, this can be done in a conventional manner, using an internal espagnolette (not shown) by pivoting the internal handle 12 or external handle upwardly.

In a conventional arrangement, upward pivotal movement of the handles would also engage the dead bolt 18, but in this embodiment of the invention, there is a novel and inventive relationship between the handles the dead bolt 18.

Figure 2 is a detailed view of the locking mechanism from the inside, showing also a manual override knob 19 and an indicator window 20. The window may for example show red when the door is locked and green when the door is open.

Figure 3 shows that if a back plate is removed from the locking mechanism 16, access can be gained to batteries 21 which power the electrical parts of the mechanism described later, and Figure 3 also shows gears 22 which operate the locked/open indicator.

The novelty and inventiveness of this embodiment of locking mechanism concerns the relationship between a first spindle assembly 23 shown in Figure

4, associated with the handles, and a second spindle assembly 24 associated with the dead bolt.

The locking mechanism incorporates a sophisticated gearbox to be described later. Figure 5 shows the locking mechanism with the gearbox lid removed. The gearbox is indicated generally by the reference numeral 25. A printed circuit board 26 can also be seen which carries all the necessary electronic components to control the locking mechanism and its drive motor 27.

The two spindle assemblies are controlled by cooperation with a control member in the form of a link arm 28 shown in Figure 6. The upper part of this link arm carries a downward projection 29 and the lower part of the arm has a slot 30a which receives a compression spring not shown, which in use biases the arm 28 into a downward position, shown in Figure 7.

Figure 7 also shows the handles in the locked position. The projection 29 engages in a recess 30 in the first spindle mechanism 23. The arm 28 is held in this downward position by a projection 29a on a cam 30a associated with the second spindle mechanism 24. The upward movement of the arm 28 is prevented because in the position shown in Figure 7, the projection 29 lies on a lug 31 projecting inwardly from the arm 28.

Figure 8 shows how the arm 28 can be moved upwardly into an open position, against the action of its biasing spring. This movement is achieved by using the motor 27 to rotate the cam 30 into a position in which a cam projection 29 pushes against a face 32 of the arm 28, raising the arm so that the projection 29 is lifted clear of the recess 30.

Figure 9 shows how the handle 12 is free to move downwardly once the projection 29 is clear of the recess 30.

Figure 10 shows a day latch position for the locking mechanism. In the day latch position, the projection 29a on the cam 30a is moved into a position in which it avoids all contact with the lever 28. Thus the lever 28 is only held in the lower position by the spring bias. In this day latch position the handle 12 can operate. This is because the portion of the first spindle assembly 23 associated with the inner handle, as indicated by the reference numeral 35 in Figure 10, has a ramp portion 36. Downward rotation of the handle 12 causes the ramp portion 36 to ride over the projection 29, pushing it and the lever 28 into the upper position.

However, the external handle, not shown, cannot be moved during the day latch position. This is because the spindle portion 37 associated with the outer handle, as shown in Figure 11, has no ramp portion. Thus, engagement of the projection 29 in a non-ramped recess 38 of the spindle portion 37 prevents any movement of the outer handle until the lever 28 has been moved upwardly by some other means.

Figure 12 shows in detail the two portions 35 and 37 of the first spindle assembly 23. There is a degree of play 40 between inter-engaging dogs 41, 42 of the split spindle assembly. Without this play, movement of the inner handle 12, even in the day latch position, would be prevented by the inner spindle portion 35 locking up against the outer spindle portion 37.

Figure 13 shows the gearbox assembly in more detail. The motor 27 drives a worm 50. This drives a cog 51 connected by a motor clutch (described later) to a smaller diameter cog 52. Cog 52 drives a large diameter cog 53 which in turn drives a smaller diameter cog 54. The teeth of cog 54 engage with the teeth of the drive member 55 which is connected to the cam 30a via a main clutch (also described later).

By using a gear train with a worm 50 and several cogs, there is a high mechanical advantage in favour of the motor 27 and very little power is required to drive the cam 30a.

The motor clutch is shown in more detail in Figure 14. The cog 52 is mounted at one end of a shaft 60. This shaft 60 passes through the cog 51 and at the other end of the shaft 60 there is a setting cap 61. The cog 52 has castellations 53 which engage between castellations 63 of cog 51. In use a compression spring is fitted in the gap 64 between the cog 51 and the cap 61.

When the motor is actuated by pressing the button 13 on the fob 14, to drive the arm 28 between positions, the inter-engagement of the castellations cause the various components to move. However when the arm 28 reaches the limit of its travel, continued driving movement of the motor causes the castellations to ride over one another. This produces a change in the current drawn by the motor which can be readily and repeatedly detected so that control components on the printed circuit board 26 cut off power to the motor.

The purpose of the main clutch assembly is to enable the cam 30a to be rotated manually by the override knob 19, if desired.

The main clutch assembly shown in Figure 1 and operates purely on a friction basis. The tooth component 55 and the cam 30a are urged together by a wave spring which fits into the gap 70. The wave spring is held in place by a washer 71 and circlet 72. There is normally sufficient friction between the two components for the necessary drive motion to be imparted. However, if the knob 19 is rotated manually, the components slip so that it is still possible for the knob 19 to be used to rotate the cam 30a.

Reduction of the likelihood that a small child can open the door is reduced by providing a toothed connection 73, 74 (see Figure 13) between a tooth component 75 of the knob and the cam 30a. Normally these teeth are out of

alignment and the knob can only be used to operate the locking mechanism by first pushing the knob inwardly to engage the teeth 73 with the teeth 74.

The tooth component 75 is used to drive a visual indicator wheel 76.

This embodiment of the invention provides an extremely versatile locking mechanism which can also be linked to safety devices within the home, such as smoke detectors, burglar alarms or panic buttons. The mechanism can also be linked to mechanisms on other doors or windows so that more than one or more entry point can be controlled from a single location, for example the main front door of a house.

Because the main components of the door assembly itself are conventional, such as spring catch 15 and security hooks 17, a locking mechanism according to the invention can readily be retrofitted to existing door assemblies.

The reader's attention is directed to all papers and documents which are filed concurrently with or previous to this specification in connection with this application and which are open to public inspection with this specification, and the contents of all such papers and documents are incorporated herein by reference.

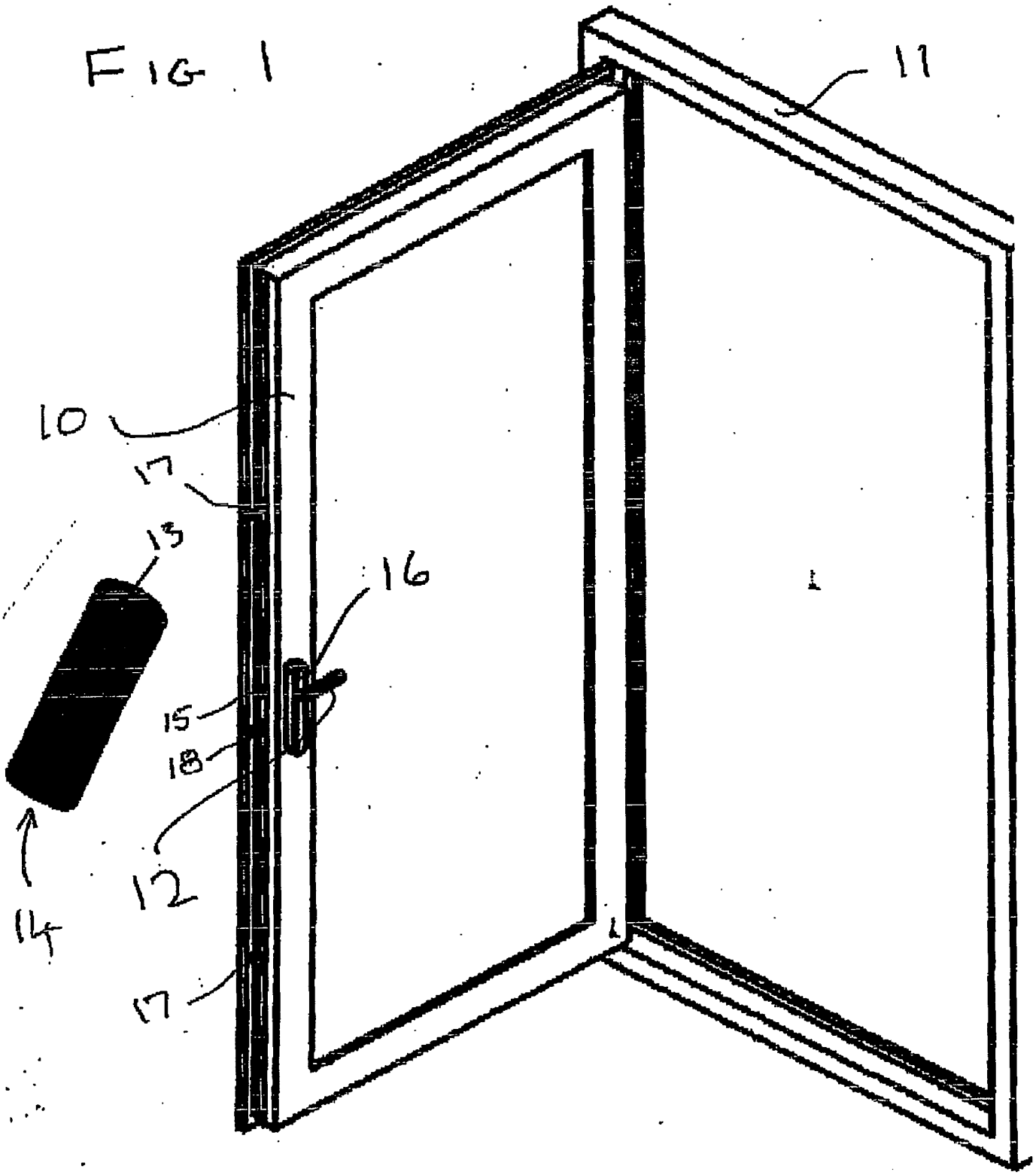
All of the features disclosed in this specification (including any accompanying claims, abstract and drawings), and/or all of the steps of any method or process so disclosed, may be combined in any combination, except combinations where at least some of such features and/or steps are mutually exclusive.

Each feature disclosed in this specification (including any accompanying claims, abstract and drawings), may be replaced by alternative features serving the same, equivalent or similar purpose, unless expressly stated

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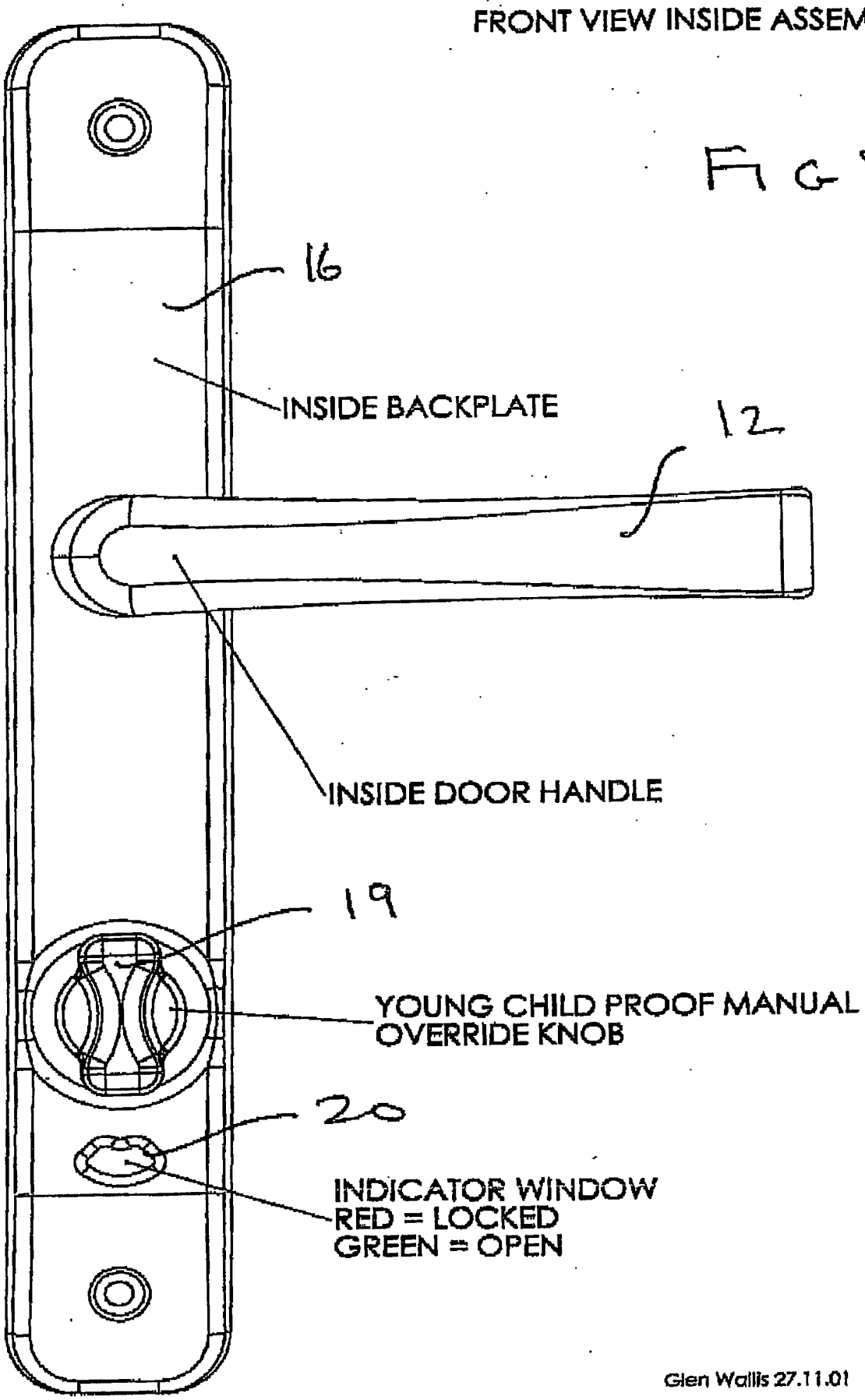
The invention is not restricted to the details of the foregoing embodiment(s). The invention extends to any novel one, or any novel combination, of the features disclosed in this specification (including any accompanying claims, abstract and drawings), or to any novel one, or any novel combination, of the steps of any method or process so disclosed.

FIG 1



FRONT VIEW INSIDE ASSEMBLY

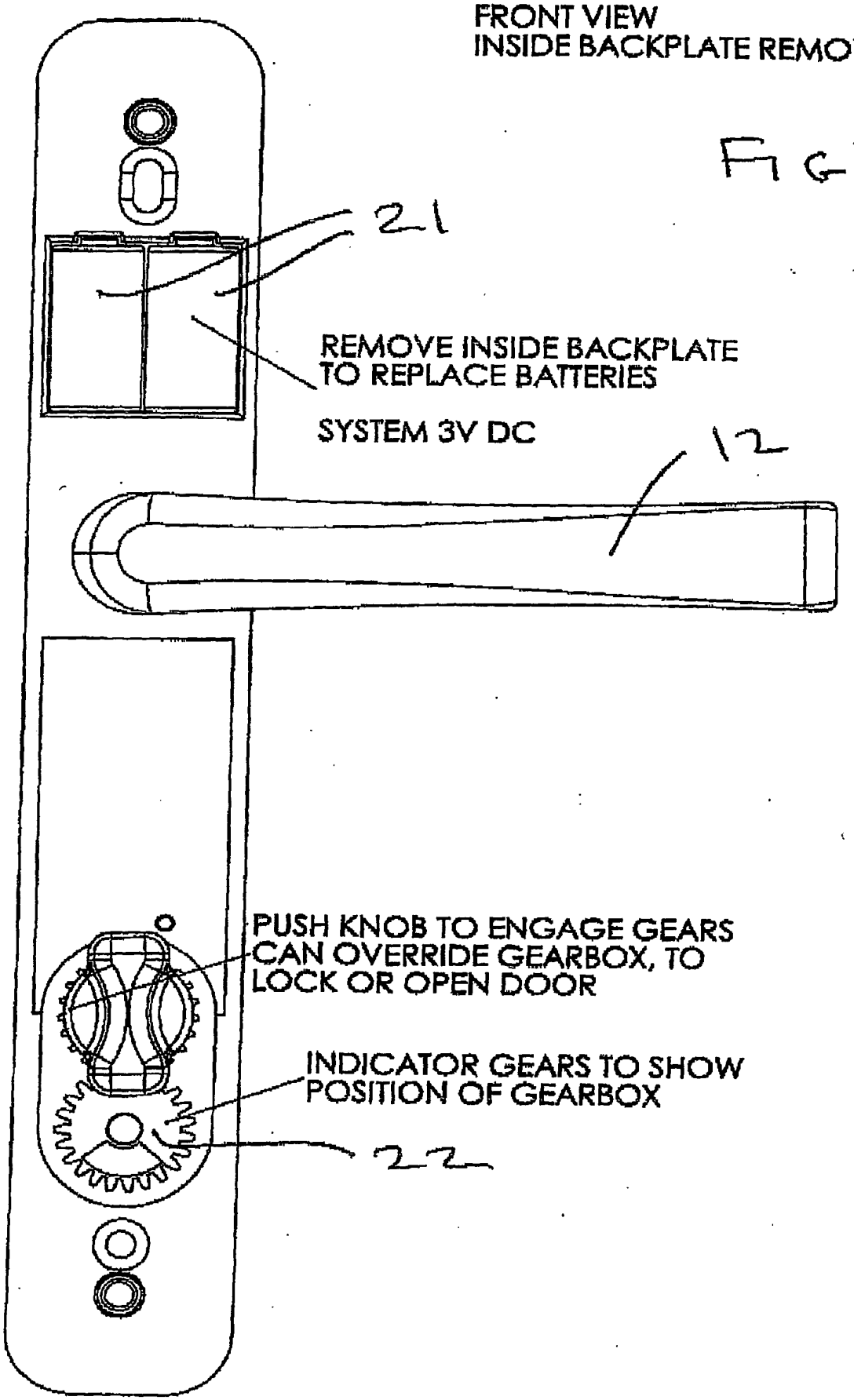
Fig 2



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FRONT VIEW
INSIDE BACKPLATE REMOVED

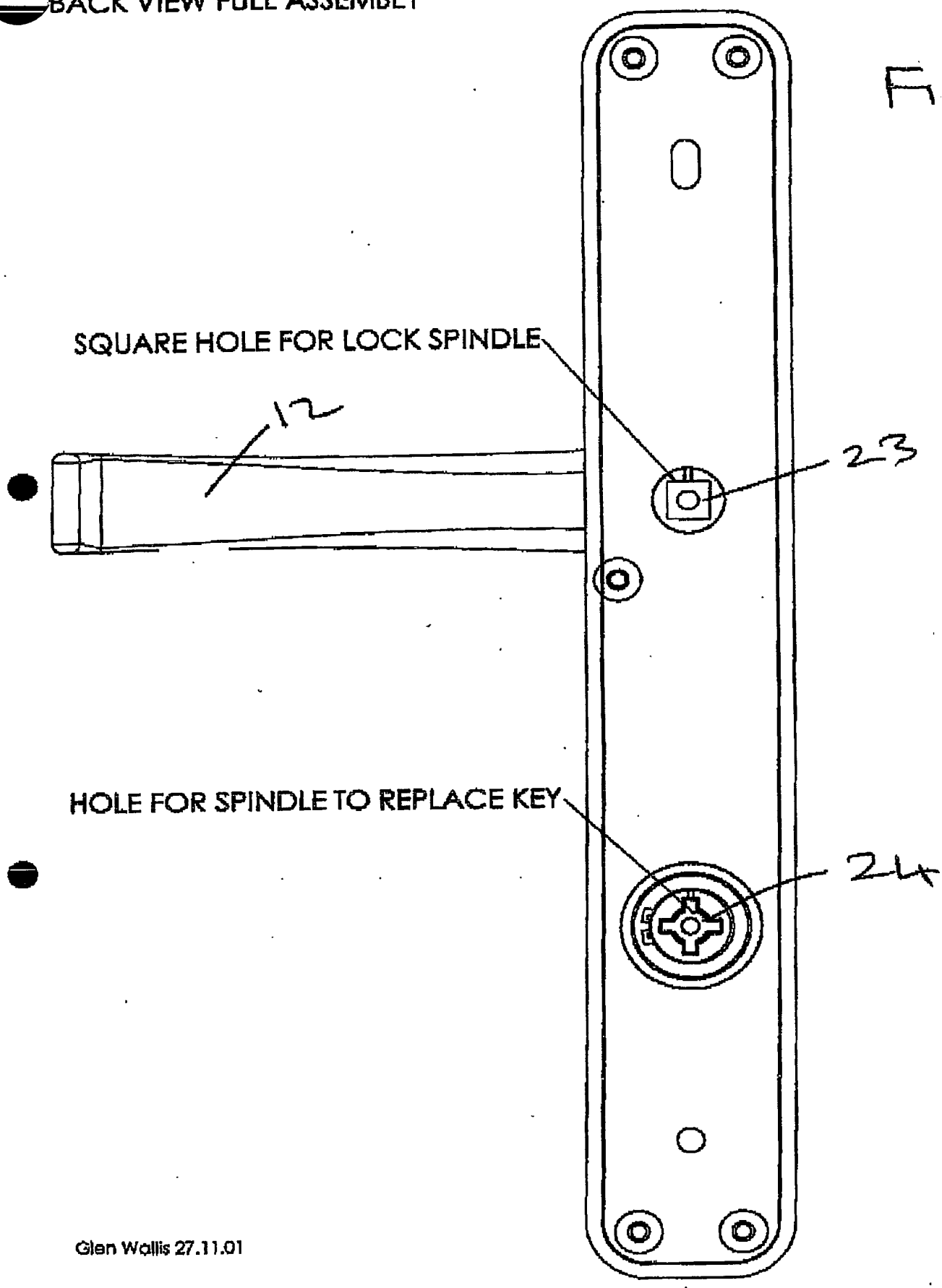
FIG 3



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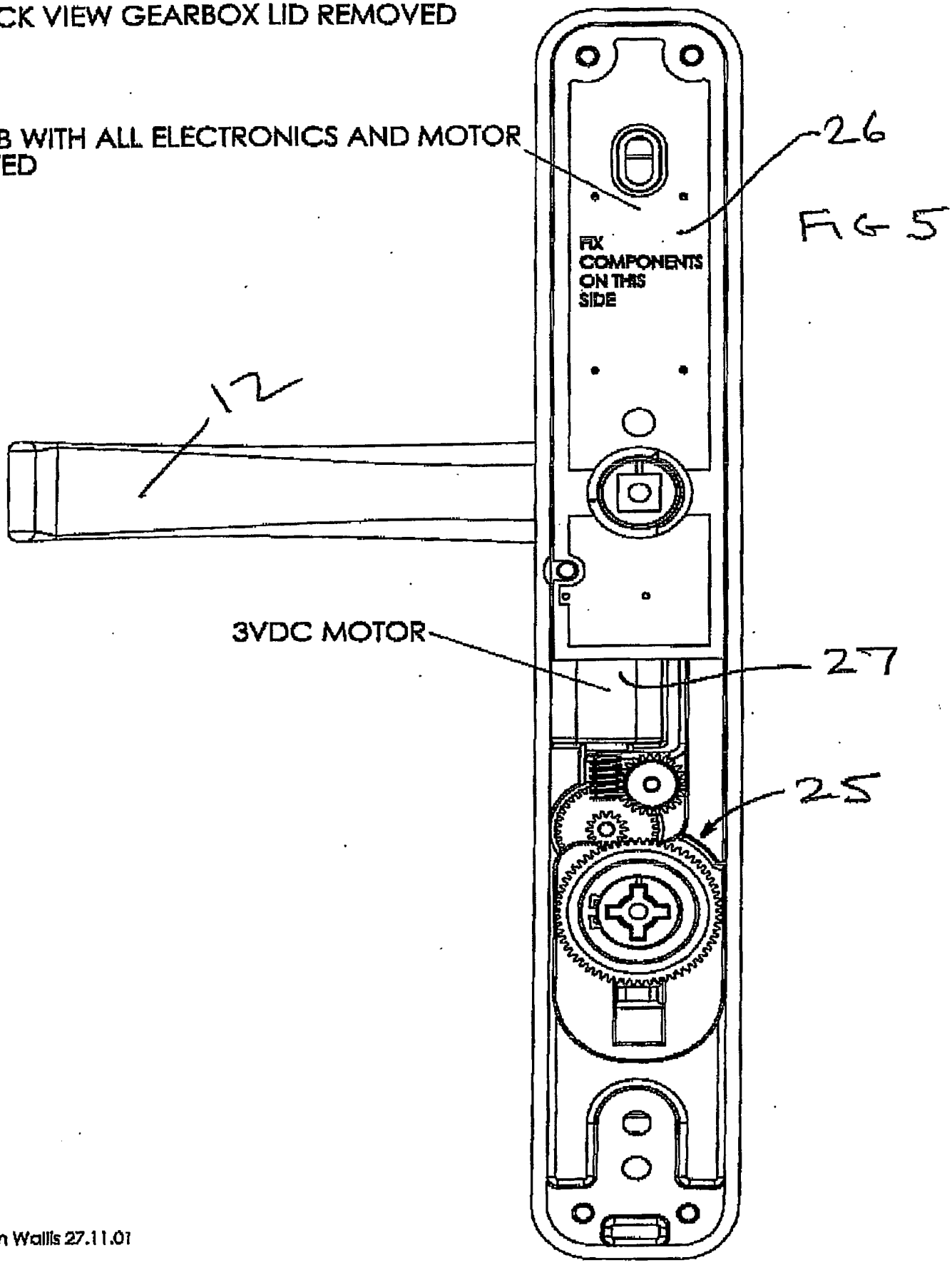
BACK VIEW FULL ASSEMBLY

FIG 4



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BACK VIEW GEARBOX LID REMOVED



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BACK VIEW NO LID OR PCB

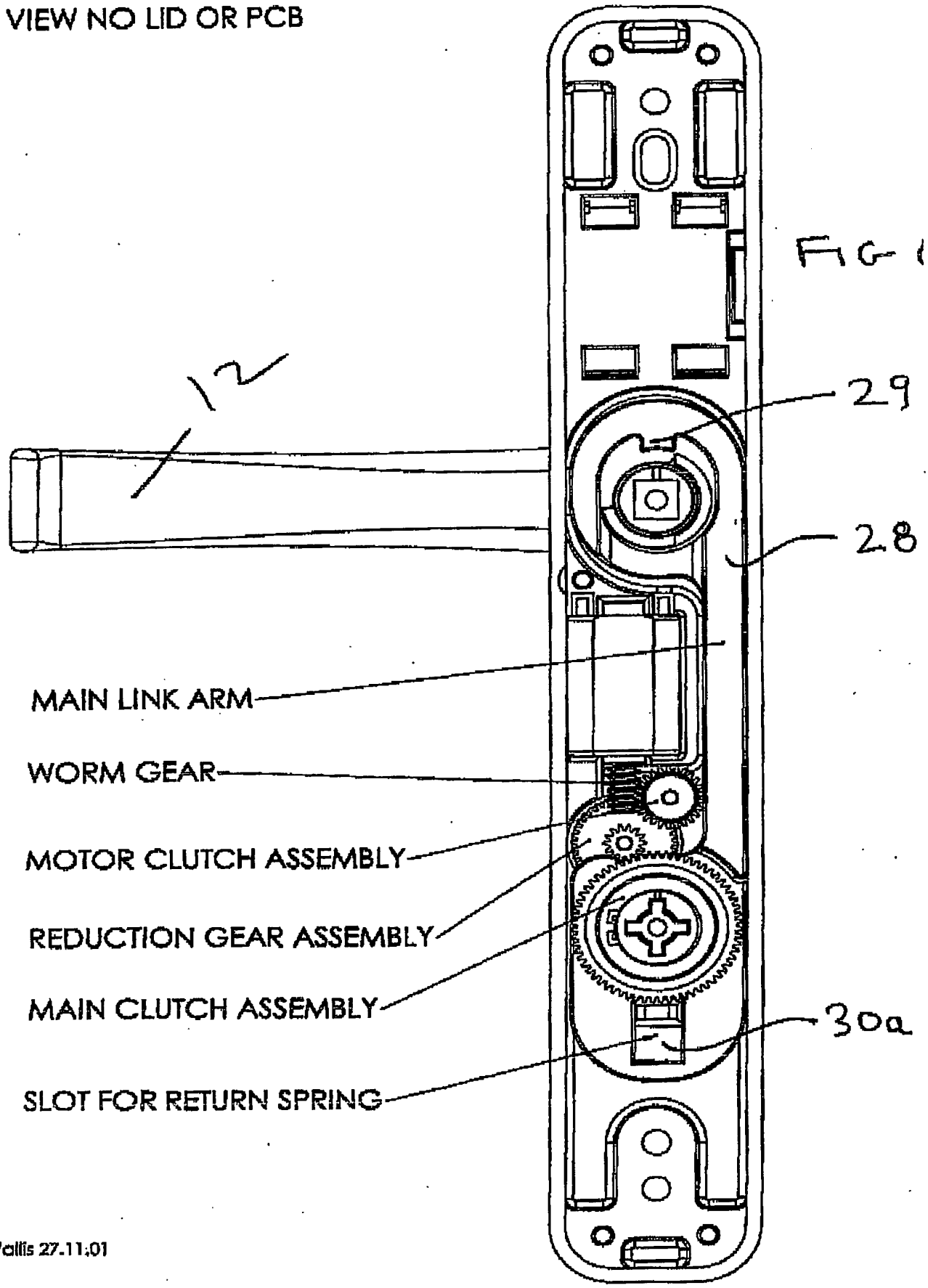
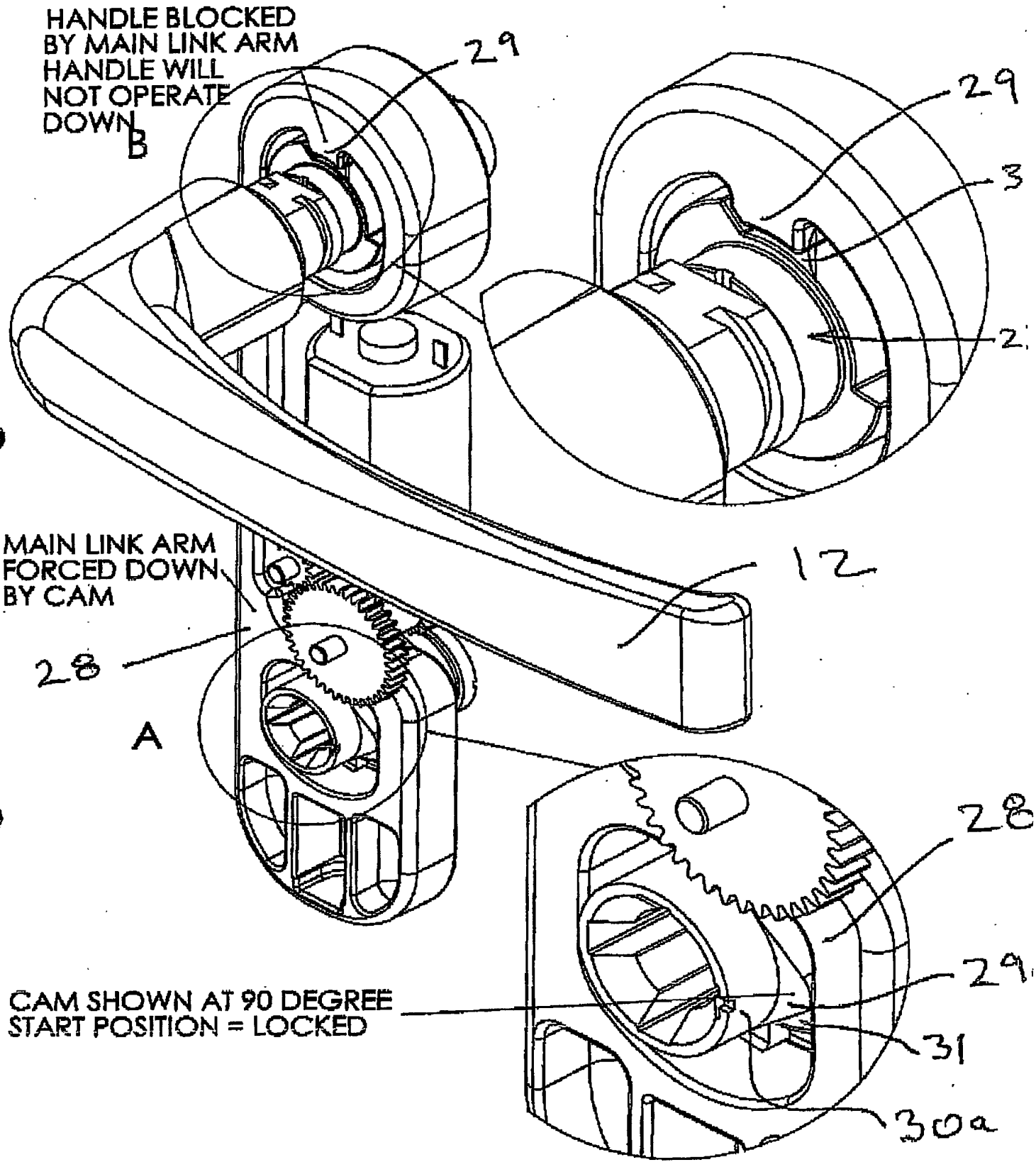


Fig 1

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GEARBOX SHOWN IN THE LOCKED POSITION

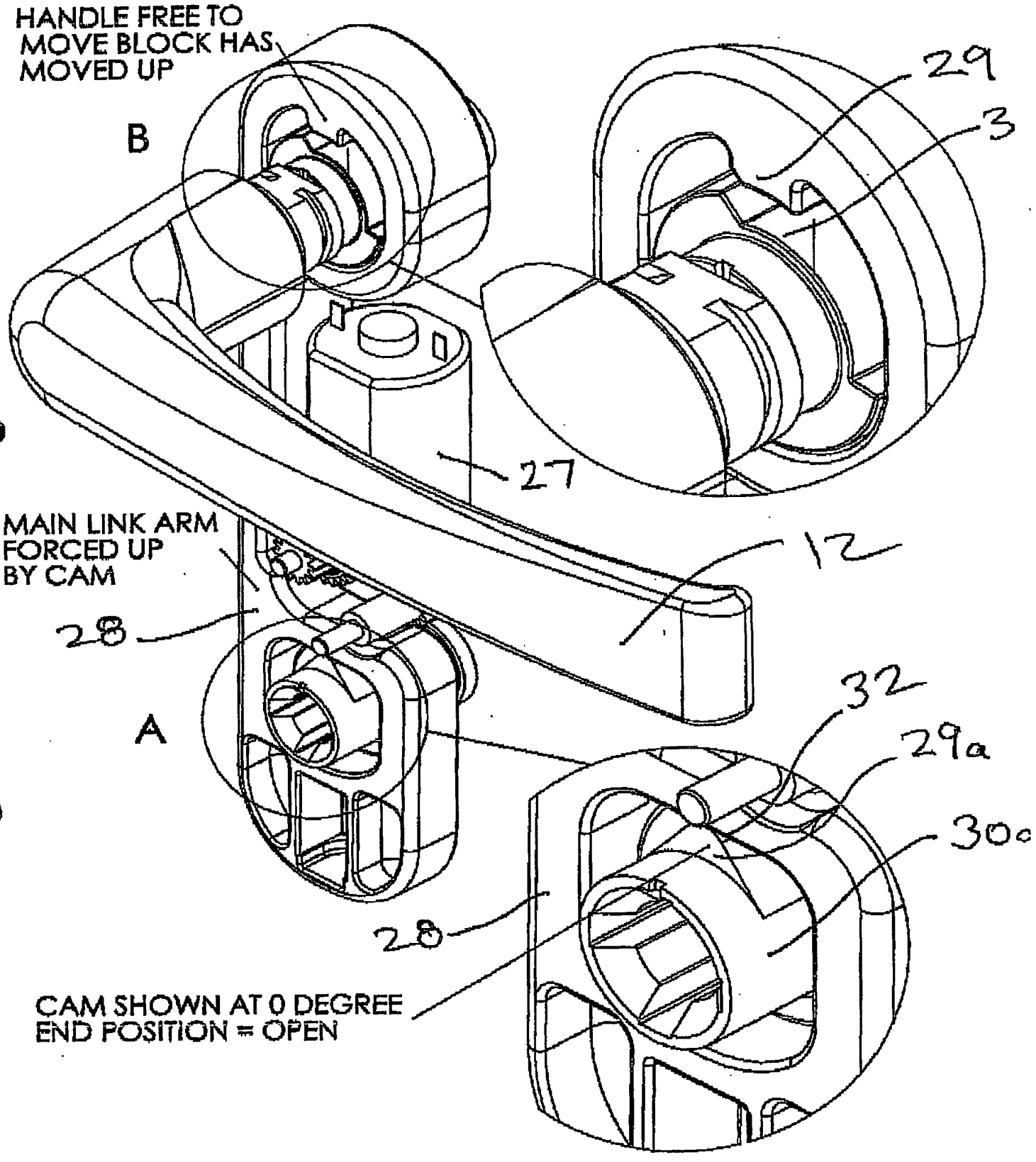
FIG 7



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GEARBOX SHOWN IN THE OPEN POSITION

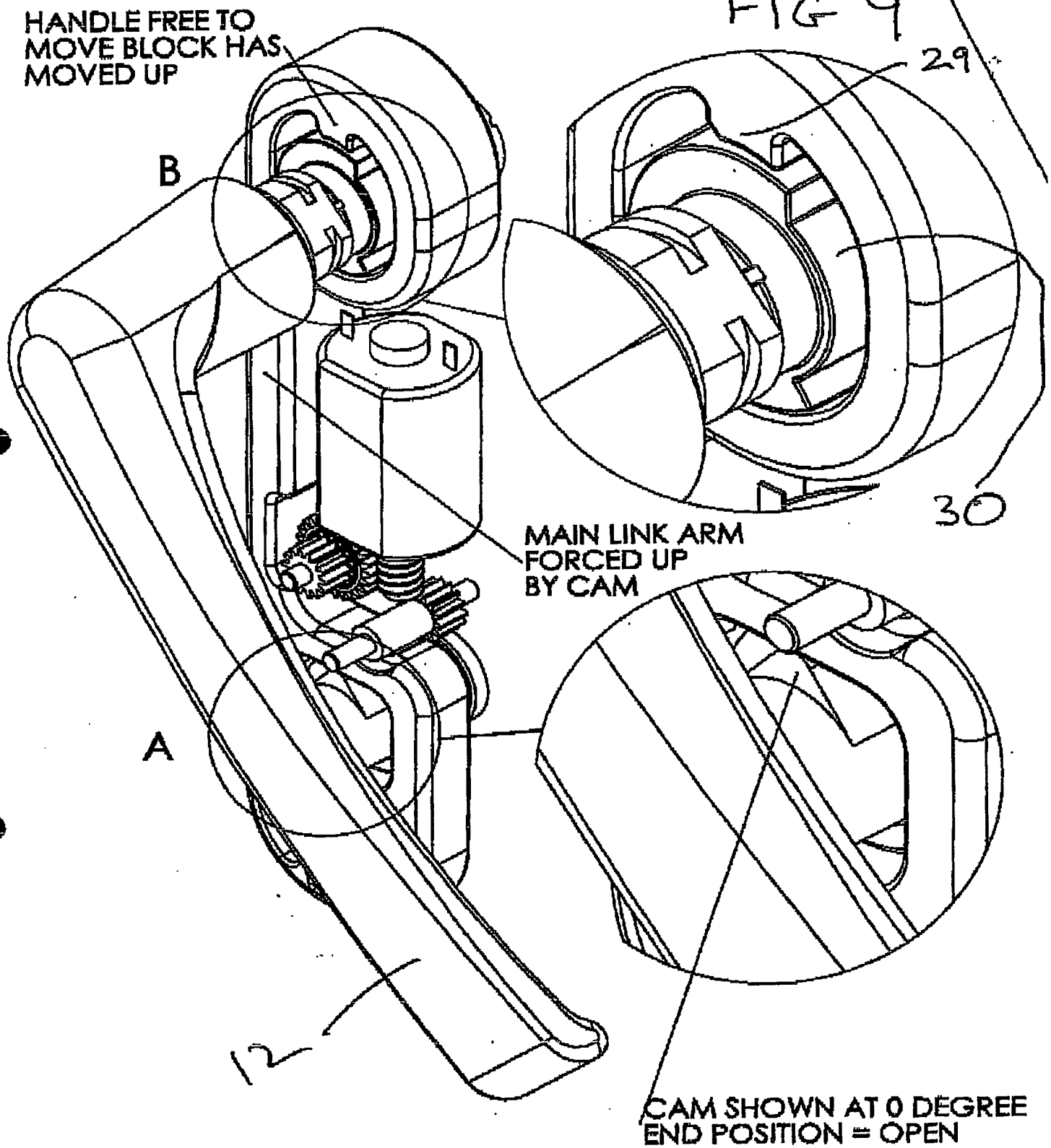
FIG 8



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GEARBOX SHOWN IN THE OPEN POSITION AND HANDLE DOWN

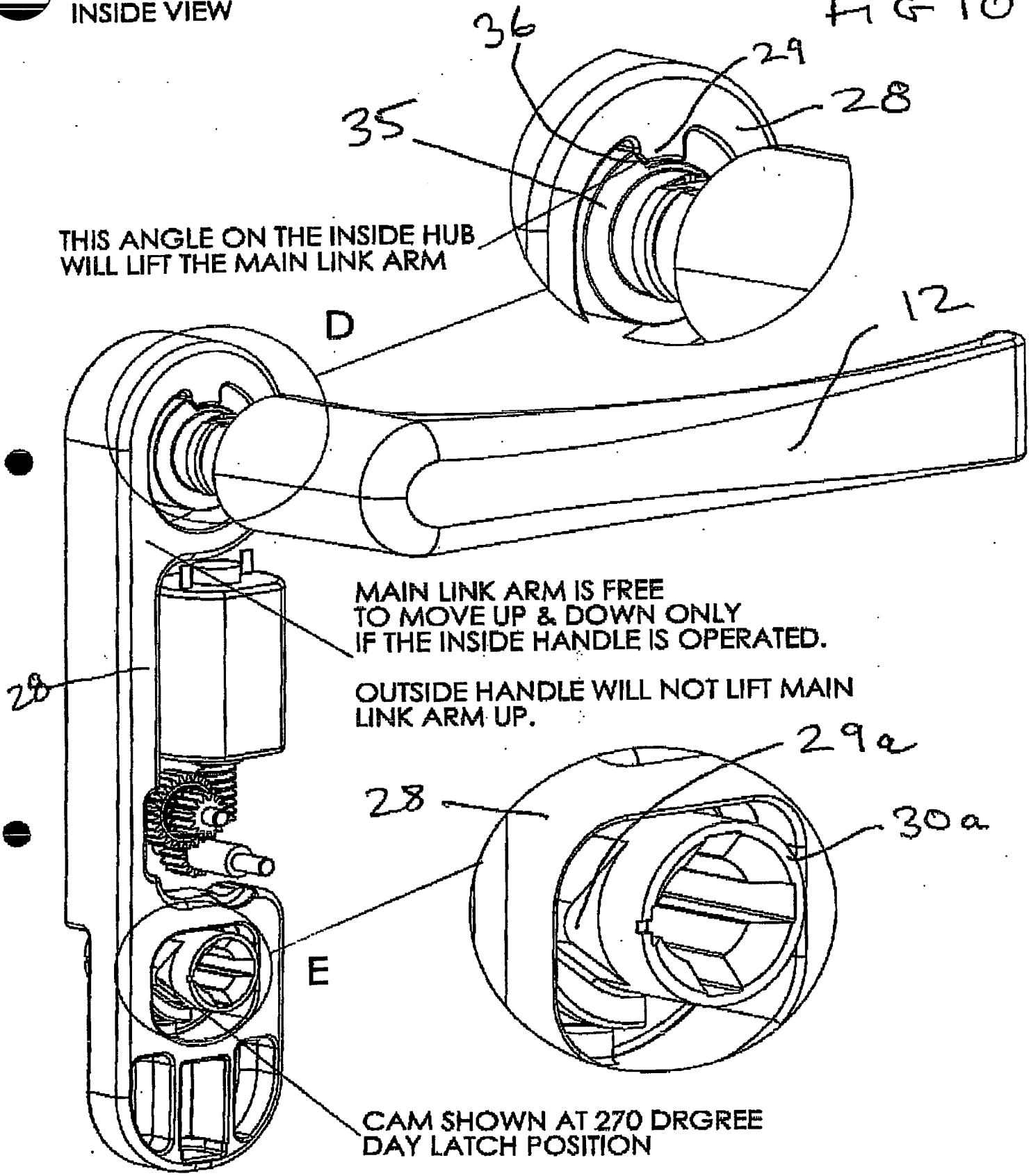
FIG 9



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GEARBOX SHOWN IN DAY LATCH POSITION INSIDE VIEW

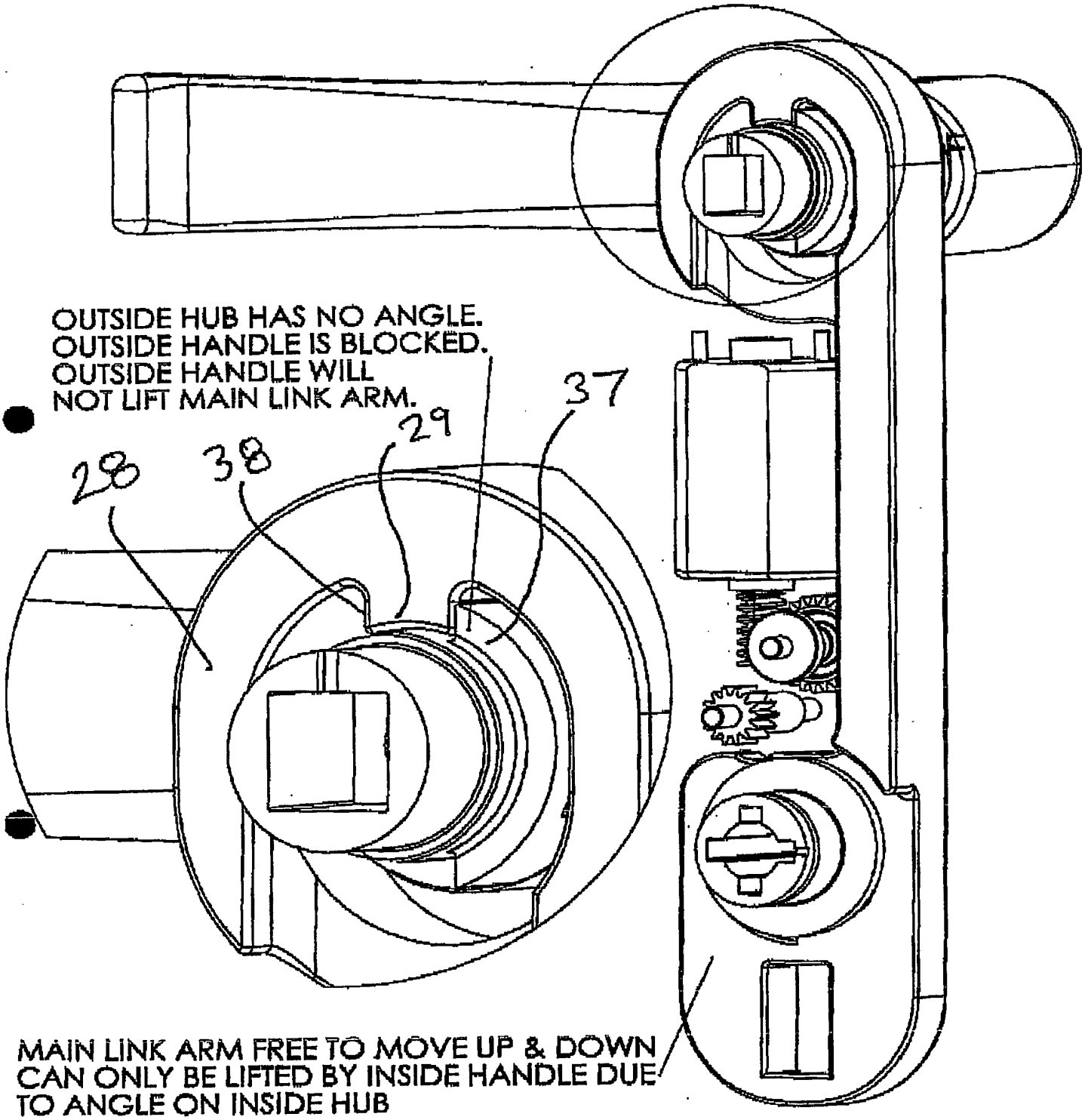
FIG 10



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FIG 11

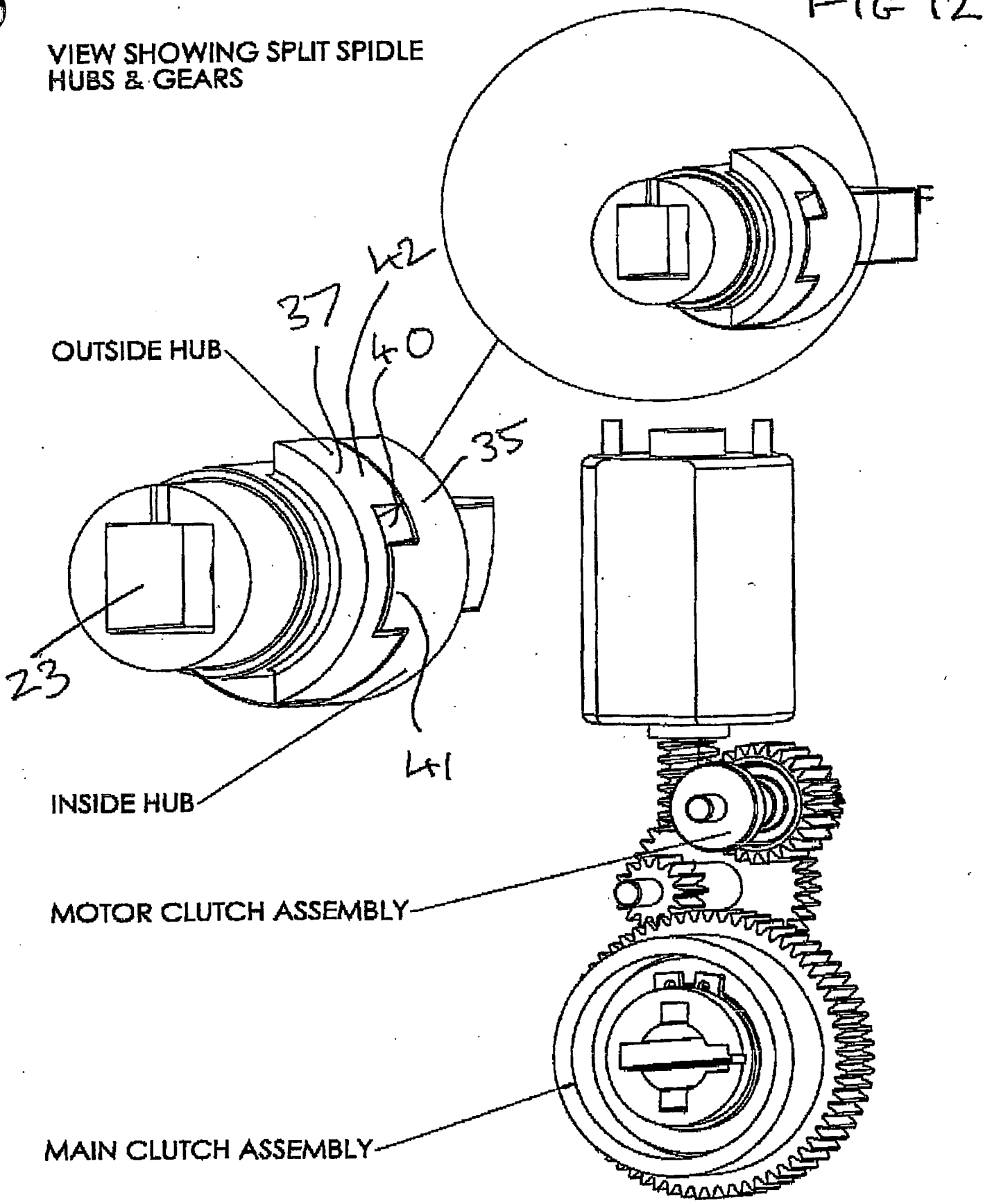
GEARBOX SHOWN IN THE DAY LATCH POSITION OUTSIDE VIEW



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FIG 12

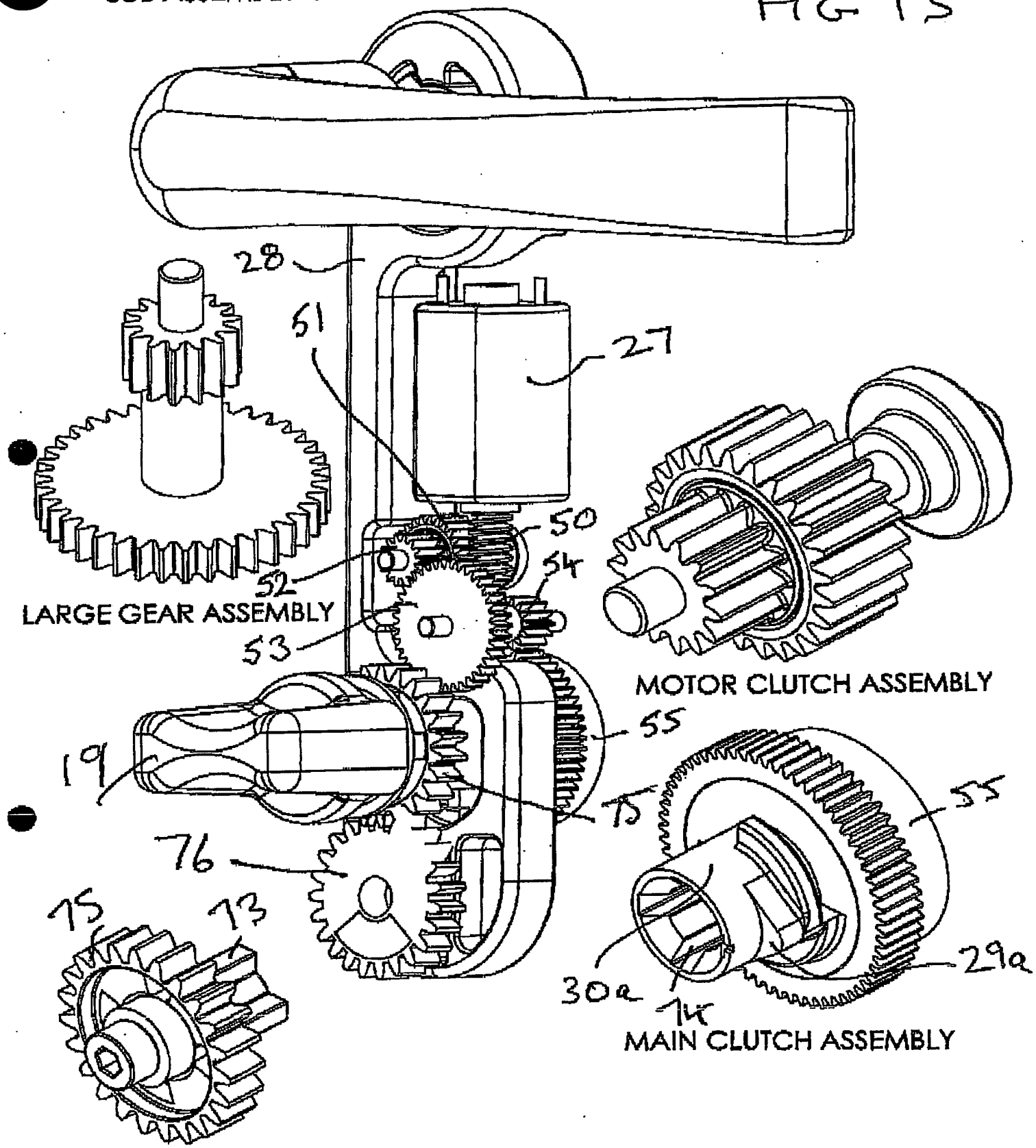
VIEW SHOWING SPLIT SPIDLE HUBS & GEARS



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SUB ASSEMBLY OF GEARBOX

FIG 13



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MOTOR CLUTCH ASSEMBLY

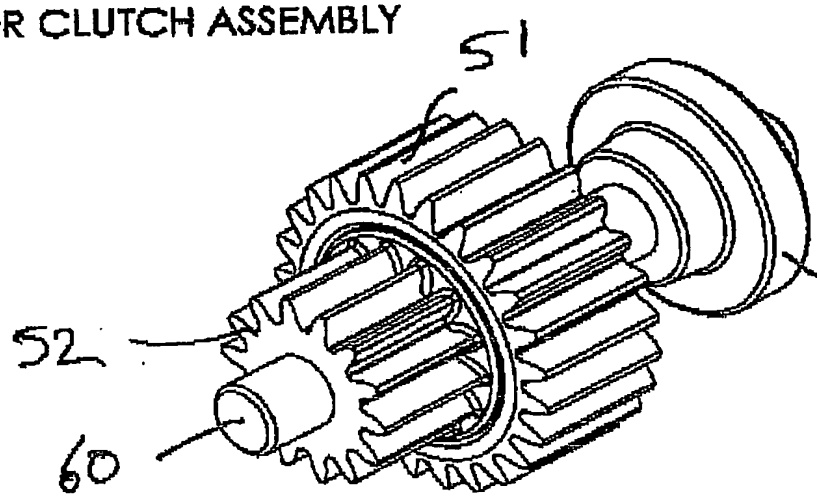
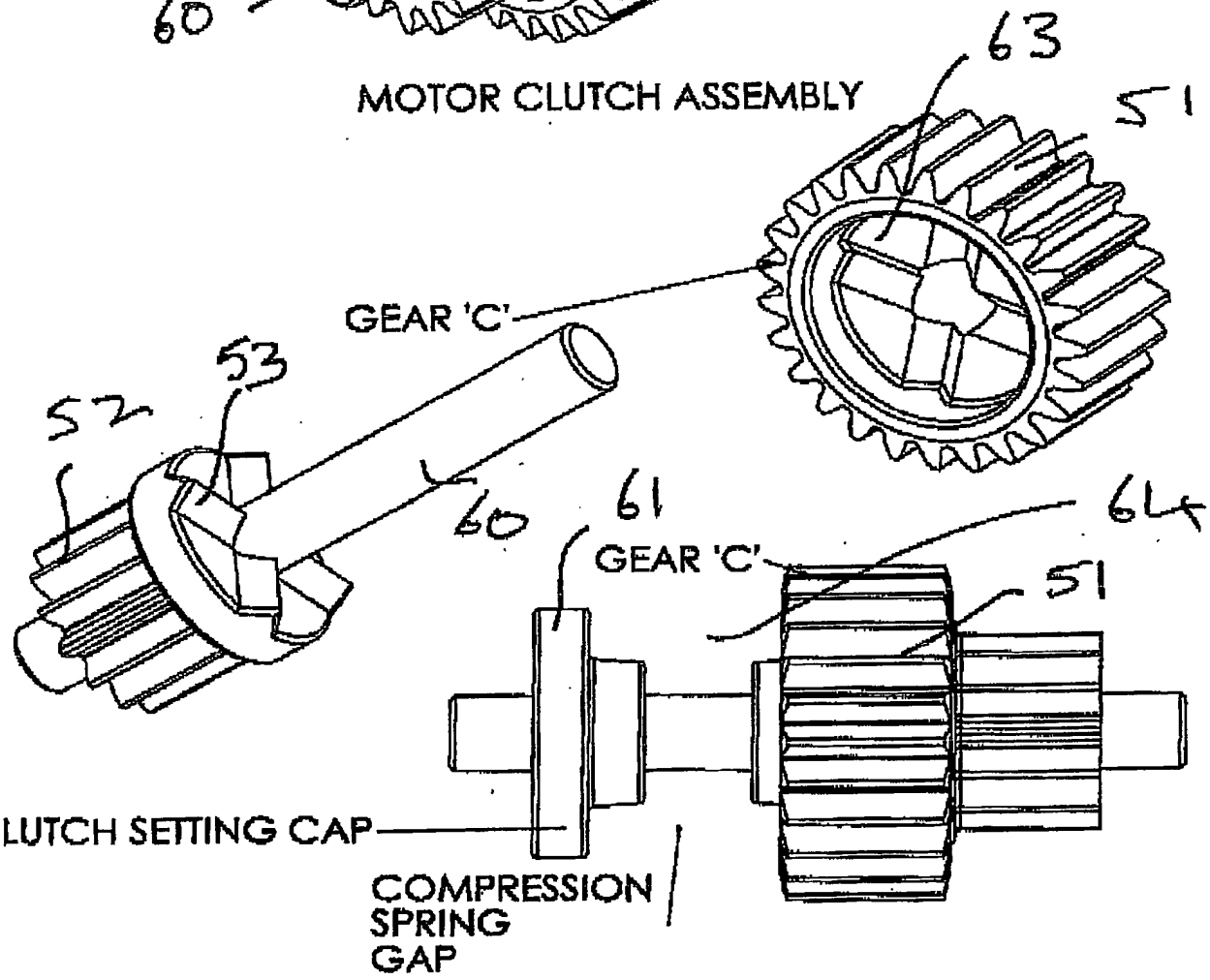


FIG 14



THE CLUTCH CAN BE SET BY SELECTING DIFFERENT SPRINGS.

AS THE TORQUE REACHES THE MAX, THE GEAR C WILL LIFT COMPRESSING THE SPRING. A CLICKING SOUND WILL SHOW THE MAX TORQUE IS REACHED.

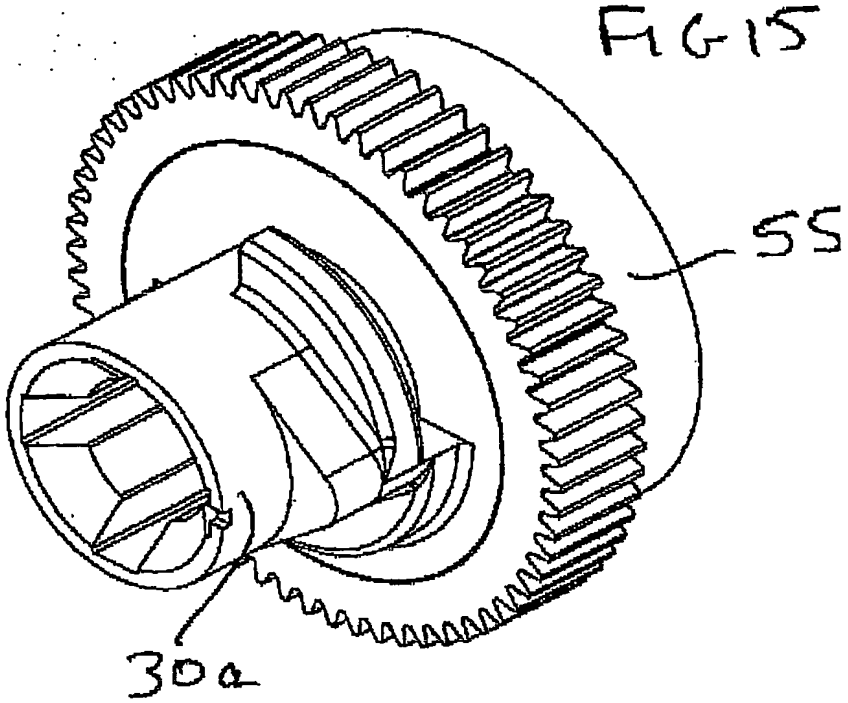
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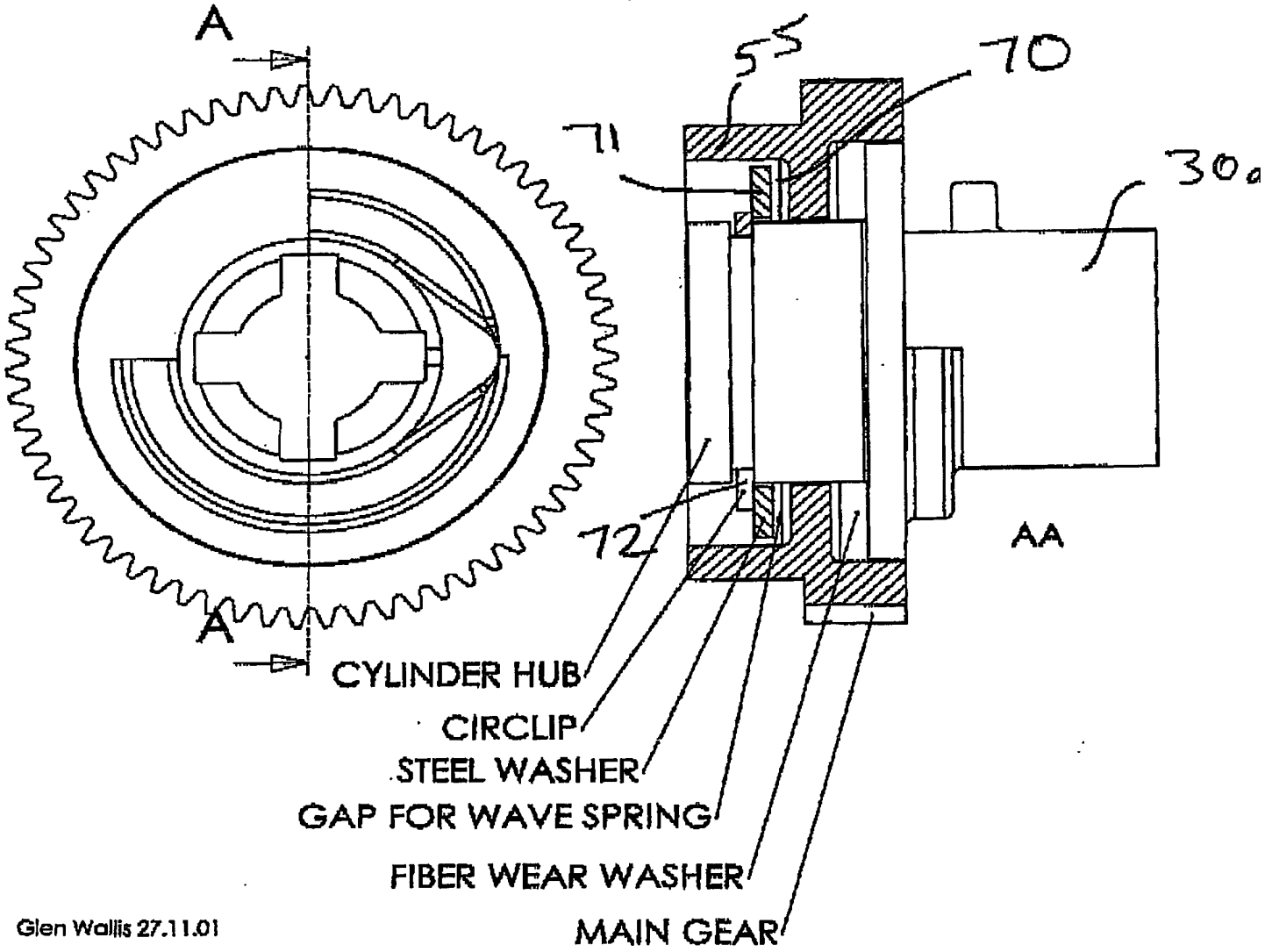
MAIN CLUTCH ASSEMBLY

FIG 15

WHEN THE CYLINDER HUB HITS THE END STOP, THE MAIN GEAR WILL STILL TURN, DUE TO THE FRICTION BETWEEN THE FIBER WASHER, MAIN GEAR & CYLINDER HUB.

A WAVE SPRING GIVES THE SET TORQUE TO THE ASSEMBLY.

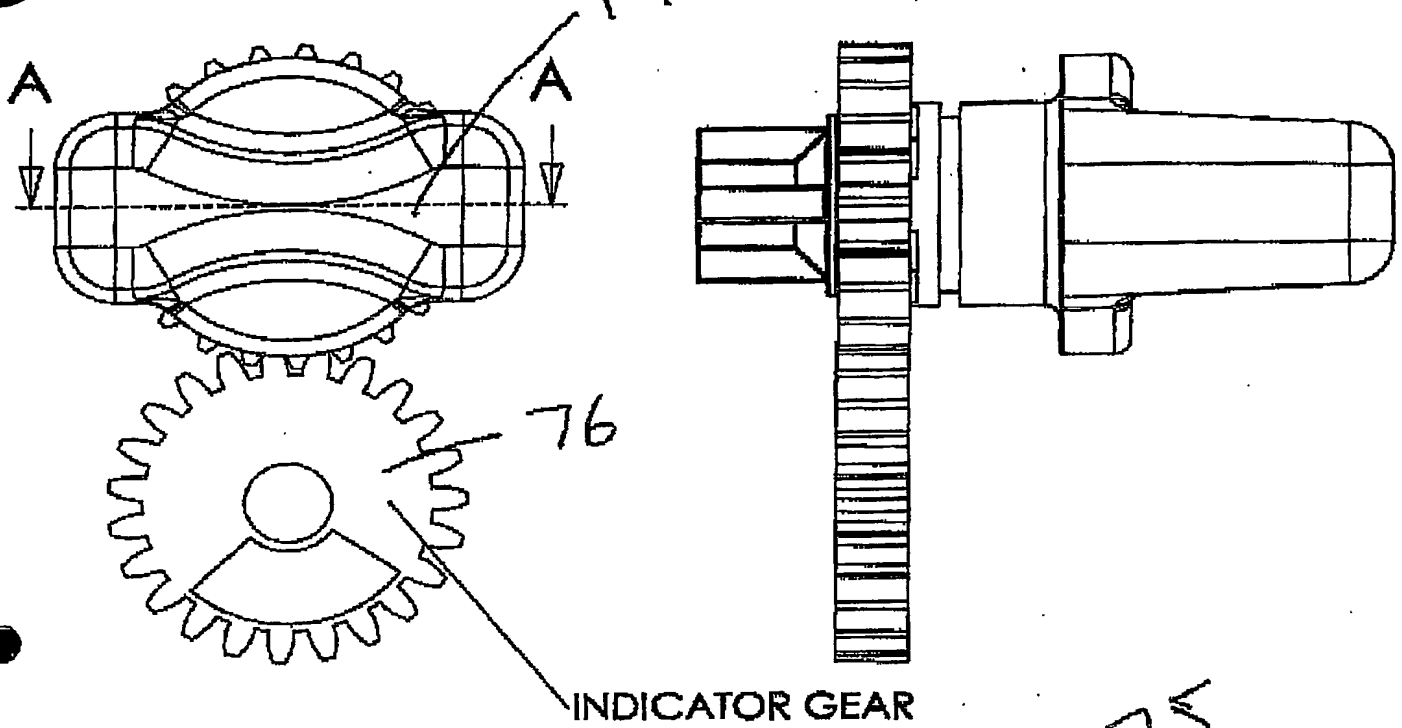


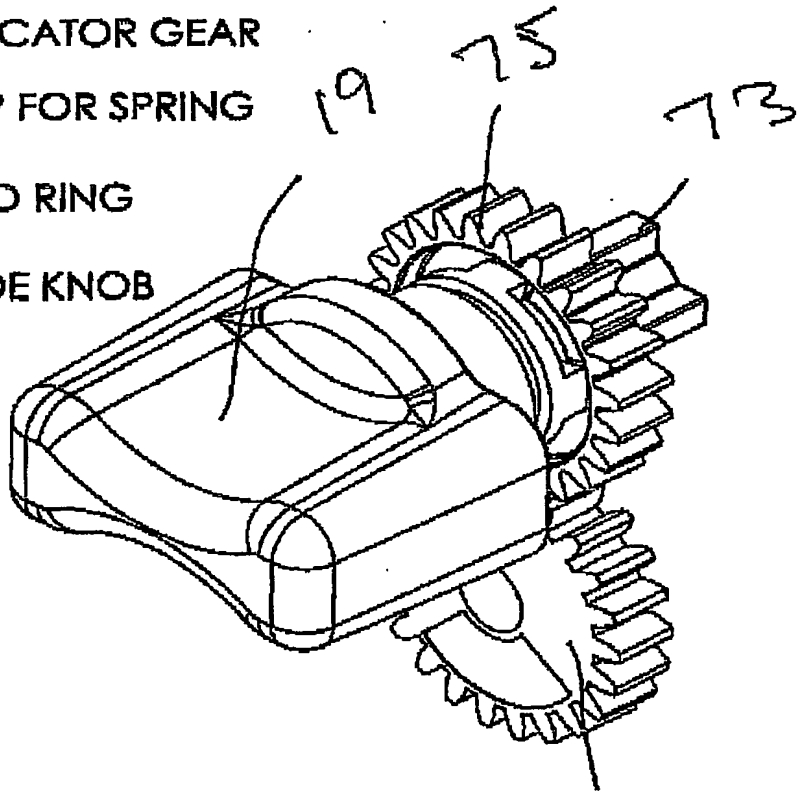


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CHILD PROOF DEVICE

FIG 16





INSIDE KNOB HAS TO BE PUSHED IN TO ENGAGE THEETH INTO CHILD PROOF GEAR.

76

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